A COMPARATIVE STUDY BETWEEN COMBINATIONS OF ULTRA-SOUND THERAPY WITH ACTIVE CHIN TUCKING EXERCISE AND ULTRASOUND THERAPY WITH SUB OCCIPITAL MUSCLE RELEASE IN THE MANAGEMENT OF NON-SPECIFIC NECK PAIN DUE TO SUB-OCCIPITAL MUSCLE TIGHTNESS AMONG COMPUTER PROFESSIONALS

A dissertation submitted in partial fulfillment of the requirement for the degree of

MASTER OF PHYSIOTHERAPY
(ELECTIVE – PHYSIOTHERAPY IN ORTHOPAEDICS)

To

The Tamil Nadu Dr. M.G.R. Medical University

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(Affiliated to the Tamil Nadu Dr. M.G.R Medical University, Chennai – 32)

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CHENNAI

APRIL 2013

DECLARATION

I hereby declare and present my thesis work titled "**A COMPARATIVE STUDY BETWEEN COMBINATIONS OF ULTRASOUND THERAPY WITH ACTIVE CHIN TUCKING EXERCISE AND ULTRASOUND THERAPY WITH SUB OCCIPITAL MUSCLE RELEASE IN THE MANAGEMENT OF NON-SPECIFIC NECK PAIN DUE TO SUB OCCIPITAL MUSCLE TIGHTNESS AMONG COMPUTER PROFESSIONALS. "**

The outcome of the original research work undertaken and carried out by me, under the guidance of **PROF. E. MAGESH, MPT, (Ph.D), RVS COLLEGE OF PHYSIOTHERAPY,** Sulur, Coimbatore.

I also declare that the material of this project work has not formed in any way the basis for the award of any other degree previously from the Tamil Nadu Dr. M.G.R Medical University.

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This study will be an incomplete one without my gratitude towards my **Respected Parents, beloved Wife, and loving Children**.

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I INTRODUCTION

Neck pain (or cervicalgia) is a common problem, with sixty percent of the population suffering with it at some point in their lives. Neck pain, although felt in the neck, can be caused by many other spinal problems. Neck pain may arise due to muscular tightness in both the neck and upper back, and pinching of the nerves emanating from the cervical spine. Non-Specific Neck Pain is the most common one. This is also known as 'simple' or “Mechanical' neck pain. The causes may be minor strains and sprains to muscles or ligaments in the neck. Bad posture seems to be the major contributing factor in many cases. Neck pain can be caused due to many other physical and emotional health problems as well.

Neck pain is more common in people who spend most of their day working at a desk, in front of the computer with a 'bent-forward' posture or ‘forward head carriage’ posture. Non-Specific Neck Pain is most often caused by continuous forward head carrying posture leading to sub-occipital muscle tightness, decreased cervical mobility and obliterated cervical spine curvature. Forward head posture is commonly adopted by visual display terminal [VDT] workers involving a combination of lower cervical flexion and upper cervical extension. The important causes of forward head posture are improperly placed computer screen, looking down while typing or reading, sitting improperly with shoulders rounded and back hunched, slouched postures or end result of faulty pelvic and lumbar spine posture.

In upper cervical spine, flexion and extension both occur at the atlanto-axial region and atlanto-occipital region. The atlanto-occipital region has greater range of motion compared to atlanto-axial region. Flexion in occiput on the atlas is limited by bony contact between anterior rim of foramen magnum and superior surface of dens. The extension is limited by connective tissue restraints of the tectorial and atlanto-

occipital membrane. The centre of rotation between C_1 and C_2 falls in the region of dens. The dens closely nestled within the anterior arch of the atlas and surrounded by transverse ligament provide stability and checks the excessive flexion and extension movement. Few degrees of rotation also occur between occiput and atlas. The shape of bony articulations and alar ligament provide rotation and prevents excessive rotation. The inferior articular process of the atlas and superior articular surface of the axis are flat to convex. The articular surface provides opportunity for rotatory motion located in the dens. The rotatory motion of C_1 and C_2 is coupled to a vertical translation of the same two vertebrae. The head is supported by the lower neck and upper back, and it is these areas that commonly cause neck pain. The first three joints in the neck allow for most movement of the neck and head. The lower joints in the neck and those of the upper back create a supportive structure for the head to sit on. If this support system is affected, then the muscles in the area will become tight, causing neck pain.

Various structures involved in transmitting pain in the cervical spine include Facet joints, Inter-vertebral discs, Nerve roots, Ligaments, Fascia, and Muscles. In pathomechanics of upper cervical spine musculature, the rectus capitis posterior minor, the superior oblique, rectus capitis posterior major and inferior oblique muscles are innervated by the dorsal ramus of C_1 (sub-occipital nerve) which exits from sub-occipital triangle superior to the arch of atlas. It is primarily a motor nerve but can have cutaneous branch that may result in pain if stretched or tapped. The sub-occipital muscles are deep and difficult to palpate. Several layers of large muscles and dense fascia are interposed between skin and these muscle groups. The location of the symptoms is usually bilateral; pain begins in the neck and spreads to sub-occipital region (area just below the posterior hair line). Tenderness will be present in neck

extensors and sub-occipital muscles, neck stiffness, and restriction of neck movements and is diagnosed by mobility test and palpation of the upper cervical spine region for tenderness. A constant forward head posture reduces the average length of the rectus capitis posterior minor, the superior oblique, rectus capitis posterior major and inferior oblique muscles. It contributes to the development of chronic neck pain. Pain associated with muscle tightness in this area is due to the result of postural problems. The patient with a marked forward head and kyphotic upper thoracic region has a compensatory hyper extension of cervical spine and head. This position leads to tightening and subsequent shortening of the sub-occipital muscles and stretch weakness of anterior neck muscles. The mechanism of pain would be an abnormally large compression force on the articular facet due to altered and sustained pull of the shortened muscles (Henry Otis Kendall, 2005).

Forward head posture is the anterior positioning of the cervical spine. In this position, head is slightly leaning forward which causes strain in cervical joints and muscles. There will be flexion in lower cervical region and extension in upper cervical region. It is a long process brought about by constant and repetitive motion, where the head is leaning to the front. For every inch the head moves forward, it gains 10 pounds in weight as far as the muscles in neck and upper back are concerned because they had to work that much harder to keep head from dropping into the chest (I.A.Kapandji, 1974).

Management of Non-Specific Neck Pain due to Sub occipital Muscle tightness includes active chin tucking exercises, ultrasound therapy, stretching, and mobilization of upper cervical muscles. Postural training is commonly used to treat poor posture and cervical dysfunction and involves exercises that are performed

repeatedly within pain free range to stretch tightened structures and strengthen weak muscles.

Ultrasound Therapy is a method of treating tissue beneath the skin's surface using sound waves. A 1MHz ultrasound will penetrate about 4" below the skin. Both the thermal and Non-thermal effects of the ultrasound are used to treat protective muscle spasm and pain. The increase in tissue temperature due to the therapy reduces the muscle spasm which causes pain in the region. This also helps in increasing the extensibility of the tissues due to the reduction in spasm.

Stretching techniques are used to increase the extensibility of the muscle tendon unit and the peri-articular connective tissue. Stretching is used to increase the flexibility. Self Stretching is also referred to as flexibility exercise or active stretching exercises (Carrie M Hall and Lori Thein Brody, 1999).

1.1 NEED OF THE STUDY

There are many treatment protocols in the management of the non-specific neck pain among computer professionals, but which of them are practically effective is not properly reported.

The need of this study is to validate and compare the effectiveness of sub occipital muscle release and Active Chin Tucking Exercises as a useful intervention in the management of Non-Specific Neck Pain due to Sub-occipital muscle tightness among computer professionals. This study serves as an initial step in a research process that would explore new Manual Therapy Techniques as useful addition to other interventions**.**

1.2 OBJECTIVES OF THE STUDY

- To determine the efficacy of physiotherapeutic techniques in the treatment of Non-Specific Neck Pain due to Sub-occipital muscle tightness among computer professionals.
- To systematically compare the efficacy of Active Chin Tucking Exercises and sub occipital muscle release in the treatment of Non-Specific Neck Pain due to Sub-occipital muscle tightness among computer professionals.

1.2 SIGNIFICANCE OF THE STUDY

- The study will create a wide spread awareness on Non-Specific Neck Pain and its implications as a barrier to an individual in the day-to-day activities at home and at workplace as well.

- The study will create awareness of body posture, physical well-being, positive attitude and mental make-up of computer professionals in enhancing their life style.
- The study will create awareness among physiotherapists about the new treatment combinations and the different choices of interventions available in treating Non-Specific Neck Pain among computer professionals.

1.4 STATEMENT OF THE PROBLEM

A comparative study between combinations of ultrasound therapy with active chin tucking exercise and ultrasound therapy with sub occipital muscle release in the management of non-specific neck pain due to sub occipital muscle tightness among computer professionals.

1.5 HYPOTHESES

The following hypotheses are framed for this study.

1. There may not be any significant difference following Ultrasound therapy with Active Chin Tucking Exercise in reducing pain and improving Neck Function among computer professionals having Non-Specific Neck Pain.

2. There may not be any significant difference following Ultrasound therapy with Sub occipital Muscle Release Technique in reducing pain and improving Neck Function among computer professionals having Non-Specific Neck Pain.

3. There may not be any significant difference between Ultrasound therapy with Active Chin Tucking Exercise and Ultrasound therapy with Sub occipital Muscle Release Technique in reducing pain among computer professionals having Non-Specific Neck Pain.

4. There may not be any significant difference between Ultrasound therapy with Active Chin Tucking Exercise and Ultrasound therapy with Sub occipital Muscle Release Technique in improving neck function among computer professionals having Non-Specific Neck Pain.

1.6. OPERATIONAL DEFINITIONS

Computer Professionals:

A computer professional is a person working in the field of Computers. This includes computer programmers and software engineers, computer scientists, computer systems analyst, computer technicians, Data entry operators, Graphic Designers, etc. (Wikipedia, 2012)

Non-Specific Neck Pain:

It is an acute (sudden onset) bout of neck pain which in most cases is not due to a serious disease or neck problem, but most often due to minor sprains or bad posture and in few cases the exact cause for the pain is not clear. (Tim Kenny, 2010)

Ultrasound therapy:

Ultrasound is a type of sound, and all types of sound consist of waves that transmit energy by alternating compressing and rarefying material. It is sound with frequency greater than 20 KHz. Therapeutic Ultrasound has a frequency between 0.7 and 3.3 MHz to maximise energy absorption at a depth of 2 to 5 cm of soft tissue. (Michelle Cameron, 2009)

Sub Occipital Muscle Tightness:

The state of activity or tension of sub occipital muscle beyond that related to its physical properties, that is, its active resistance to stretch. (Thomas Lathrop Stedman, 1995)

II REVIEW OF RELATED LITERATURE

One of the very important early steps in a research project is performing the review of literature. This is also one of the most humbling experiences we are likely to have. It is because we are most likely to find out that any important idea we have, has been thought of before, at least to some extent. A literature review is always performed to identify related studies, to set the current project within the conceptual and theoretical context. When looked at that way, almost no topic is so new or unique that you can't locate relevant and informative related studies.

In the literature review we can find the following things;

First, the researcher can find a study that is quite similar to the one we are thinking of doing. Since all authentic and credible research studies have to review the literature themselves, we can verify their literature review to get started on our own study.

Second, prior research will help ensure that we include all of the important relevant constructs in our study. We may find that other similar studies routinely look at an outcome that we might not have included. Our study would not be judged properly if it ignored a major construct.

Third, the literature review will help us to find and select appropriate measurement instruments/tools. We will readily see what measurement instruments/tools those researchers used themselves in contexts similar to ours.

Finally, the literature review will help us to anticipate common problems in our study context. We can use the prior experiences of others to avoid common traps and pitfalls.

SECTIONS

Section A: **Studies on Non Specific Neck Pain related to Computer Professionals.**

Section B: **Studies on the effectiveness of Ultrasound Therapy in treating Protective Muscle Spasm.**

Section C: **Studies on the effectiveness of Sub Occipital Muscle Release in reducing Sub Occipital Muscle Tightness.**

Section D: **Studies on the effectiveness of Active Chin Tucking Exercise in reducing Neck Pain.**

Section E: **Studies on the reliability of Visual Analog Scale in measuring Pain.**

Section F: **Studies on the reliability of the Copenhagen Neck Function Disability Scale in measuring Neck Function.**

SECTION A: STUDIES ON NON-SPECIFIC NECK PAIN RELATED TO COMPUTER PROFESSIONALS.

Andrew Shashi Reggie, et al. (2012), found out the prevalence of neck pain among computer users in both university staff and students. 328 computer users between 19 and 50 years of age of which 110 desktop users and 218 laptop users were distributed questionnaires. The ergonomical evaluation on-site of the participants was also done for the desktop users and various positions used by laptop users were evaluated. The data obtained were analyzed using descriptive statistics. The prevalence rate and the percentage of various positions used by computer users were also analyzed. Finally the team concluded that the prevalence of neck pain among laptop computer users is higher than desktop computer users in this cross-sectional study.

Minakshi Grover, et al. (2011), conducted a survey research in Hisar district of Haryana state to find out the musculoskeletal problems of computer users and the preventive measures adopted by those users. The sample comprised of 200 computer users ranging from 25-40 years of age, using computer at least for the last one year and for a minimum of 4-6 hours daily. Working profile of the respondents revealed that on an average, 6-8 hours daily were spent by private computer users whereas it were 4-6 hours by public computer users. Data Entry was the main Job of the maximum number of the respondents. Specially designed Tables were used by more than half of respondents (54%) and specially designed chairs were used by nearly one- third respondents (32.0%). Majority of the respondents (81.5%) reported musculoskeletal problems as they were working long on the computer at a stretch. The magnitude of pain was highest in neck and lower back. Watching the screen at a

stretch, holding neck more or less in the same position for a long time, and sitting in poor posture for a long time were the reasons mentioned for pain in different body parts by computer users.

Richa Talwar, et al. (2009), found out the prevalence of health problems among computer professionals and its association with working conditions. They included 200 computer professionals viz. software developers (78), call center workers (56), and data entry workers (66) in their study. Mean age of sample was 28.23 with 58.5% of subjects being in the age group of 20-29 years. Regarding hours at work spent in front of computer, 60 (30%) reported spending 3-6 hr/day, 88 (44%) spent 6-9 hr/day, while 52 (26%) of the respondents spent more than 9 hr/day working on a computer. The team found out that the prevalence of visual problems was 76% (152/200), and musculoskeletal problems were 76.5% (153/200). They concluded that among the common musculoskeletal problems, pain/ stiffness in neck contributed to 48.6%.

B. Cagnie, et al. (2007), estimated the one-year prevalence of neck pain among workers in the office and to determine which physical, psychological and individual factors were associated with that prevalence. 512 office workers were sampled for the study. Information was collected by the way of online questionnaire. Dependent variable was considered to be Self-reported neck pain during the preceding 12 months, whereas different individual, work-related physical and psychosocial factors were studied as independent variables. 45.5% was the 12 month prevalences of neck pain in office workers. The results of their study indicated that physical and psychosocial work factors, as well as individual variables, were associated with the frequency of neck pain.

A.K Sharma, et al. (2006), explored the magnitude of computer related health problems. The team studied around 200 IT professionals with different Job profiles like, software developers (82), call center (54) and data entry/processing (64) as sample population. The Mean age of the study subjects was 29.8± 4.3 years with 53.5% of the subjects being in the age group 21-30 years. The team found that the magnitude of computer related problems were as high as 93% in this study. The most common musculoskeletal symptoms were pain (55%) and stiffness (14.8%). The team concluded that among the common musculoskeletal problems, pain/ stiffness in neck contributed to 44%.

SECTION B: STUDIES ON EFFECTIVENESS OF ULTRASOUND THERAPY IN TREATING PROTECTIVE MUSCLE SPASM.

Dana L Davis, et al. (2010), stated that Ultrasound equipment generates high-frequency sound waves that are transferred to a specific body area via a round-headed transducer / probe. The sound waves travel deep into tissue (e.g. muscles), creating gentle heat/ temperature. As the probe glides over the skin's surface, sound waves penetrate the skin's surface causing soft tissues to vibrate. In turn, the heat induces vasodilatation, drawing blood into the target tissues. Increased blood flow delivers needed oxygen and nutrients, and removes cell wastes. The heat helps relieve pain and inflammation, reduce muscle spasms, and accelerate healing. Depending on the treatment area, range of motion may also be increased.

Roger J. Allen, (2003), stated that in contrast to superficial agents, deep-heating agents are capable of producing temperature elevations at tissue depths of 3 cm or more through conversion of a non-thermal energy source into heat within tissue. One of the most commonly used deep-heating physiotherapeutic agents is ultrasound therapy. Ultrasonic energy causes soft tissue molecules to vibrate from exposure to the compression and rarefaction caused by the acoustic wave produced by the probe. Increased molecular motion leads to micro-friction between molecules, and frictional heat is generated, thus increasing tissue temperature. Referred to as ultrasound's ''thermal effects,'' this heating is reported to produce increased collagen extensibility, increased nerve conduction velocity and altered local vascular perfusion. Thus he states that the therapeutic ultrasound can be used to increase local area blood circulation, reduce muscle spasm and reduce neuralgic pain.

Moodley M, (**1999),** studied the effectiveness of spinal manipulation and ultrasound in mechanical pain. 30 subjects (aged 16-60 years) with neck pain were divided into two groups. The first group received spinal manipulation (high-velocity, short-amplitude thrusts in the direction of the planes of articulation of the posterior facet joints) twice a week for four weeks. The second group received ultrasound (pulsed, 0.5 watts/cm2 – 1.0 watts/cm2, five minutes' duration) for the same time period. Goniometry, algometry, pain rating scales and a neck disability index were used as the measurement instruments. He concluded that both ultrasound and adjustments are useful in treating mechanical neck pain.

Sridhar V. Vasudevan, (1997), stated that Physical rehabilitation emphasizes the use of modalities such as heat, cold, and electricity, and hands-on techniques such as manipulation, mobilization, massage, and traction. Heat, one of the oldest modalities

to relieve pain, can also decrease muscle spasm and improve function. Ultrasound, first introduced for medical use in the United States in the late 1940s, uses high-frequency acoustic vibration that is converted into heat. Deep-heating modalities increase temperature to depths of 3–5 cm. Ultrasound is the preferred treatment in most painful disorders, especially those arising from soft tissues and ligaments, as it has greater penetration and also non-thermal effects, such as increasing extensibility of tissues. Physiological effects of ultrasound include analgesia, increased flexibility of collagenous tissues, and reduction of muscle spasm through selective decrease in excitation of nociceptive nerve endings. Increased muscle temperature also decreases spindle sensitivity and reduces "muscle spasm."

SECTION C: STUDIES ON THE EFFECT OF SUB OCCIPITAL MUSCLE RELEASE IN REDUCING SUB OCCIPITAL MUSCLE TIGHTNESS.

Rupali Gupta, et al. (2011), found out whether stretching of Sub occipital muscle influenced pain and range of motion in patients with cervicogenic headache and also if this stretch influenced the disability status of patients with cervicogenic headache. They concluded that, though conventional treatment is equally effective in reducing pain associated with cervicogenic headache, our intervention i.e. Sub occipital muscle stretch is more effective in increasing cervical range of motion. They concluded that, though this stretch in itself when given separately may not be as effective but it can definitely be combined as a crucial treatment adjunct in the treatment of cervicogenic headache.

Jordan Miller, et al. (2010), found out the optimal management technique for cervicogenic headache, and said that Manual therapy interventions are often used with or without physical medicine modalities to treat neck pain. They assessed the effect of 1) manipulation and mobilization, 2) manipulation, mobilization and soft tissue work, and 3) manual therapy with physical medicine modalities on pain, function, patient satisfaction, quality of life (QoL), and global perceived effect (GPE) in adults with neck pain. They performed a computerized search for randomized trials up to July 2009. They concluded that moderate quality evidence (1 trial, 221 participants) suggested mobilization, manipulation and soft tissue techniques decrease pain and improved satisfaction when compared to short wave diathermy, and that this treatment combined with advice and exercise produces more improvements in GPE and satisfaction than advice and exercise alone for acute neck pain.

Luke Hamilton, et al. (2007), investigated whether High Velocity Low Amplitude manipulation (HVLA) of the occipito–atlantal (OA) joint and/or Muscle Energy Technique (MET) stretch had an effect on pressure pain thresholds (PPT) in the sub occipital musculature in an asymptomatic sample. They concluded that neither HVLA manipulation nor MET significantly changed the PPT of the sub occipital muscles in asymptomatic participants. Both techniques produced greater mean increases in PPT when compared to the control group, and recommended investigation of the effect of these techniques in a symptomatic population.

Gwendolen Jull, (2006), stated that Practitioners of orthopedic physical therapy are very familiar with patients presenting for management of neck pain and headache. It has long been accepted that cervical structures, particularly those innervated by the upper three cervical nerves, have the capacity to refer pain into the head and cause

headache. Anatomically, any nociceptive activity arising from disease or disorders in upper cervical joint structures (C_0-C_3), in muscles innervated by the upper three cervical nerves, or in the nerves themselves can access the trigemino-cervical nucleus and thus can be responsible for headache. The headaches most likely to respond to management methods such as manipulative therapy and therapeutic exercise to the cervical region are logically cervicogenic headaches which present pain in the upper cervical region also. The author concluded that there is evidence that this treatment regime can be successful for the management of this headache type.

SECTION D: STUDIES ON THE EFFECTIVENESS OF ACTIVE CHIN TUCKING EXERCISE IN REDUCING NECK PAIN.

Michael J. Walker, et al. (2008), assessed the effectiveness of manual physical therapy and exercise (cervical retraction/ Chin Tucking, deep neck flexor strengthening, and cervical rotation ROM exercises) for mechanical neck pain with or without unilateral upper extremity symptoms, as compared to a minimal intervention approach. 94 subjects with a primary complaint of mechanical neck pain, with or without unilateral Upper Extremity symptoms, were randomly selected. They concluded that manual physical therapy and exercise program indicated clinically and statistically significant short- and long-term improvements in pain, disability, and patient perceived recovery in patients with mechanical neck pain when compared to another treatment program.

Hanten, et al. (2005), determined the effectiveness of manual therapy for balancing C_1 and a home exercise program, including active neck retraction (Chin Tucking)

exercises performed in a series of progressions, in the treatment of cervicogenic headache. They selected a 42-year-old male (Subject 1) and a 25-year-old female (Subject 2), both with a primary complaint of right-side sub occipital headache. They concluded that manual therapy with home program of active neck retraction (Chin Tucking) exercises in a series of progressions was successful in relieving cervicogenic headache and improving neck function in two subjects.

Pearson ND, et al. (1995), investigated the immediate effects of 10, 20, and 30 repeated neck retraction movements (Chin Tucking exercises) on the retraction range of motion and resting neck posture in asymptomatic subjects. They selected two groups of 15 subjects, one group 20-29 years old and the other 50-59 years old. Their results indicated that there was significant change in resting neck posture. They both concluded that if the postural change were to occur in patients, this treatment maneuver could be beneficial for those attempting to maintain a more retracted neck position for pain relief.

SECTION E: STUDIES ON THE RELIABILITY OF VISUAL ANALOG SCALE IN MEASURING PAIN.

Serap Tomruk Sutbeyaz, et al. (2006), evaluated the effect of electromagnetic field therapy (PEMF) on pain, range of motion (ROM) and functional status in patients with cervical osteoarthritis (COA). Thirty-four patients with COA were included in a randomized, double-blind study. During the treatment, the patients lay on the mat for 30 min per session, twice a day for 3 weeks. Primary outcome measures were Visual Analog Scale -VAS and NPDS. The pain intensity was assessed by means of a visual analogue scale (VAS). Functional status and related disability measure was assessed

by the ‘‘Neck Pain and Disability Scale’’ (NPDS) before and after therapy. NPDS is a 20-item questionnaire developed by using the Million Visual Analogue Scale as a template. Finally, the team concluded that for all patients in the study they found visual analog scale to be reliable in measuring pain.

Crossley K M, et al. (2004), examined the test-retest reliability, validity, and responsiveness of several outcome measures in the treatment of patellofemoral pain. The data from 71 persons enrolled in an RCT of a conservative intervention for patellofemoral pain were used to evaluate the measures' validity and responsiveness. A subset of this cohort (n=20) was used to assess reliability. Main outcome measures used here were Visual Analog Scale (VAS), the functional index questionnaire (FIQ); the anterior knee pain scale (AKPS) and the global rating of change. They concluded that the AKPS and VAS for usual or worst pain are reliable, valid, and responsive and are therefore recommended for future clinical trials in assessing treatment outcome in persons with patellofemoral pain.

Bijur P.E, et al. (2001), assessed the reliability of the VAS for measurement of acute pain. This was a prospective convenience sample of adults with acute pain presenting to two Emergency Depts. Intra class correlation coefficients (ICCs) with 95% confidence intervals (95% CIs) and a Bland-Altman analysis were used to assess reliability of paired VAS measurements obtained 1 minute apart every 30 minutes over two hours. The paired measurements were more reproducible at the extremes of pain intensity than at moderate levels of pain. Reliability of the VAS for acute pain measurement as assessed by the ICC appears to be high. Ninety percent of the pain ratings were reproducible within 9 mm. They concluded that these data suggest that the VAS is sufficiently reliable to be used to assess acute pain.

SECTION F: STUDIES ON THE RELIABILITY OF THE COPENHAGEN NECK FUNCTION DISABILITY SCALE IN MEASURING NECK FUNCTION.

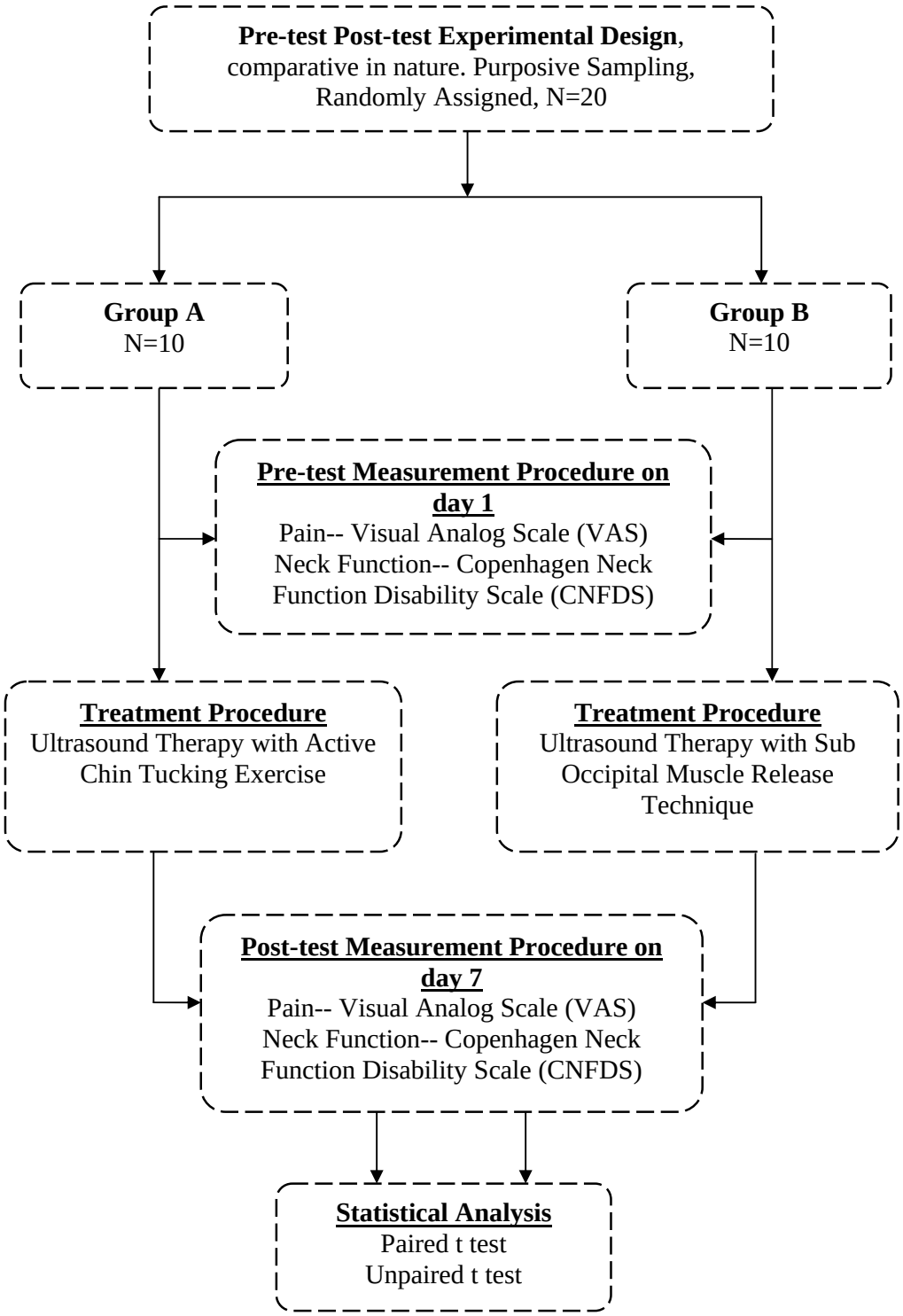
Yapali, et al. (2012), translated the CNFDS into Turkish language and assessed its reliability and validity among patients with neck pain in Turkish population. One hundred and one subjects who had chronic neck pain were included in this study. The CNFDS, Neck Pain and Disability Scale, and visual analogue scale were administered to all subjects. The team concluded that the Turkish version of the CNFDS is a reliable and valid instrument for Turkish people.

Fejer R, et al. (2008), investigated the relationship between neck pain (NP) intensity, NP duration, and disability based on the population-based 'Funen Neck and Chest Pain' study. Pain intensity was measured using 11-box numerical rating scales, pain duration was measured using the Standardized Nordic Questionnaire, and disability was measured by the Copenhagen Neck Functional Disability Scale. The team concluded that, pain intensity and disability should be considered as two distinct dimensions and measured separately. These results have implications for future clinical and epidemiological studies.

Jordan A, e**t al. (1998),** determined and demonstrated the reliability and validity of the Copenhagen Neck functional disability scale in neck pain subjects. The testing was done using 162 patients with neck pain divided into three sample groups. Test-retest reliability of the scale was carried out on the same day with one sample (n = 39), and between-day reliability was carried out with another (n = 21). Responsiveness was measured using patients participating in a clinical trial involving

patients with chronic neck pain (n = 102). Additionally, scale scores were compared with a wide range of physical measurements using the patients in the clinical trial. The team concluded that the disability scale demonstrated excellent practicality and reliability. The scale accurately reflects patient perceptions regarding functional status and pain as well as doctor's global assessment and is responsive to change over long periods of time.

III. METHODOLOGY



3. 1 STUDY DESIGN

Pre-test Post-test Experimental Design, comparative in nature.

3. 2 STUDY SETTING

This study was conducted at Yogananda Medical and Research centre, Bangalore, Karnataka.

3.3 STUDY DURATION

The study was conducted for a period of 7 days.

3.4 SELECTION OF SUBJECTS

20 computer professionals aged between 22 and 30 years who fulfilled inclusion and exclusion criteria were selected by purposive sampling method and randomly assigned to two groups of 10 subjects each. Group A was assigned for Ultrasound Therapy with Active Chin Tucking Exercises and Group B for Ultrasound Therapy with Sub Occipital Muscle release Technique.

3.5 CRITERIA FOR SELECTION OF SUBJECTS

Inclusion Criteria

- Subjects having neck pain for more than 1 week.
- Age of the Subject is between 22 and 30years.
- Both male and female were included as subjects in the study.
- Subjects working on computers for more than 30 hrs a week.

Exclusion Criteria

- Subjects with any Cervical Anomalies like Cervical Rib, Disc pathology.
- Subjects with upper or lower motor neuron disorders.
- Subjects with degenerative changes in the cervical spine.

- Subjects who had undergone any surgery around the neck.
- Subjects having congenital Short Neck, wry neck, torticollis.
- Subjects having Asymmetrical spinal curvatures like increased Kyphosis, lordosis and scoliosis.
- Other forms of neck pain other than Mechanical Neck Pain.
- Subjects undergoing medications for any form of headaches like vascular or tensional or Migrenal.
- Subjects having ankylosing spondylosis, rheumatoid arthritis and other arthropathies.
- Subjects having head ache and neck pain due to ophthalmic problems.
- Un-cooperative patients.

3.6 VARIABLES

Independent Variable

- Active Chin Tucking Exercises with ultrasound therapy
- Sub Occipital Muscle release Technique with ultrasound therapy

Dependent Variable

- Pain
- Neck Function

3.7 MEASUREMENT TOOL

- Visual Analog Scale (VAS).
- Copenhagen Neck Function Disability Scale (CNFDS).

3.8 PROCEDURE

3.81 Measurement procedure

Visual Analog scale

The Visual Analog scale is a measurement tool that measures a characteristic or attitude which ranges across a continuum of values and cannot easily be directly measured.

Operationally VAS is an horizontal line, 10 cm in length, anchored by word descriptors at each end, as illustrated in Fig: 1. The subject marks on the line a point that they feel represents their perception of their current state of pain. The VAS score is determined by measuring in millimeters from the left hand end of the line to the point that the subject marks.

Fig: 1 shows the Visual Analog scale –VAS (Not to actual scale)

No Pain **Severe Pain**

Copenhagen Neck Function Disability Scale

The Copenhagen Neck Function Disability Scale is used to evaluate the disability experienced by patients with neck pain. The scores can be monitored over time to evaluate the disease course and response to any intervention. It is set of 15 questions which rates as 0, 1 and 2 based on their ability and disability. The disability index is the sum of all the scores, where the higher ratings imply greater disability.

Both Group A and Group B subjects were involved in pre-test and post-test assessment by Visual Analog Scale and Copenhagen Neck Function Disability Scale.

3.82 Treatment procedure

Volume of Training

20 minutes per session

1 session per day

Total number of sessions 7

Treatment Procedure for Group A

Ultrasound therapy

Position of the Subject: Sitting in front of a couch and bending the head forward and leaning over the pillows placed on the couch.

Position of Therapist: Standing behind the Subject.

Procedure: 1 MHz pulsed ultrasound with 1.0 watts/cm^2 intensity was given on the sub-occipital region for 4 minutes duration.

Picture 1: Researcher giving Ultrasound Therapy

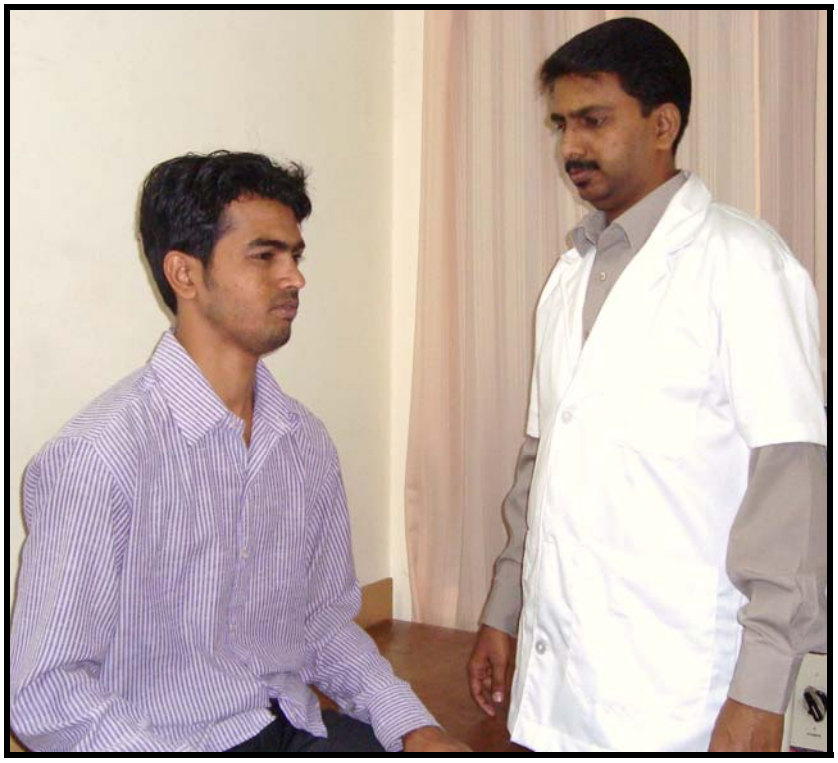
Active Chin Tucking Exercises

Position of the Subject: High Sitting on the couch.

Position of Therapist: Standing next to the subject viewing the lateral aspect.

Procedure: The subject is asked to retract the neck into proper posture aligning the head over the shoulder and then asked to pull the neck slightly up and the chin slightly down to place the neck in cranio-cervical flexion. There is a little head nodding motion as if the subject is nodding "yes" and the chin pulls towards the neck and the back of the head arches slightly up. This causes a stretching sensation at the base of the skull. The subject is asked to perform this exercise 30 times in one session with a hold of 20 seconds each time and a rest interval of 30 seconds after every 10 times (Carolyn Kisner and Lynn Allen Colby, 2007).

Picture 2: Researcher teaching starting position of Active Chin Tucking Exercise



Picture 3: Researcher teaching ending position of Active Chin Tucking Exercise

Treatment Procedure for Group B

Ultrasound therapy

Position of the Subject: Sitting in front of a couch and bending the head forward and leaning over the pillows placed on the couch.

Position of Therapist: Standing behind the Subject.

Procedure: 1 MHz pulsed ultrasound with 1.0 watts/cm^2 intensity was given on the sub-occipital region for 4 minutes duration.

Sub Occipital Muscle release Technique

Position of the Subject: Supine lying on the couch.

Position of Therapist: Standing at the head end of the supine lying subject.

Procedure: The therapist places both his palms under the head of the subject, reaching the posterior arch of the atlas (C1) just caudal to the superior nuchal line on the sub occipital region with his curled-up fingers and places an upward pressure causing a stretch and distraction for 30 seconds, until tissue relaxation has been achieved. This technique was performed 3 times in one session with a rest interval of 1 minute after each time (Carolyn Kisner and Lynn Allen Colby, 2007).

Picture 4: Researcher performing Sub Occipital Muscle Release Technique

IV DATA ANALYSIS AND RESULTS

4.1 Data Analysis and Interpretation

The data collected from 20 subjects were evaluated statistically. Descriptive analytical study was done by using Paired‘t’ test and Unpaired‘t’ test.

a) Paired‘t’ test

$$\bar{d} = \frac{\Sigma d}{n}$$

$$s = \frac{\sqrt{\Sigma d^2 - \frac{\Sigma(d)^2}{n}}}{n-1}$$

$$t = \frac{\bar{d}\sqrt{n}}{s}$$

Where,

d – Difference between pre test and post test values

$\bar{d}$ – Mean of difference between pre test and post test values

n – Total number of subjects

s – Standard deviation

b) Un paired‘t’ test

$$s = \sqrt{\frac{\Sigma(x_1 - \bar{x}_1)^2 + \Sigma(x_2 - \bar{x}_2)^2}{n_1 + n_2 - 2}}$$

$$T = \frac{\bar{x}_1 - \bar{x}_2}{s} \sqrt{\frac{n_1 n_2}{n_1 + n_2}}$$

Where,

S = Standard deviation

n_1 = Number of subjects in Group A

n_2 = Number of subjects in Group B

$\bar{x}_1$ = Mean of the difference in values between pre-test and post-test in Group-A

$\bar{x}_2$ = Mean of the difference in values between pre-test and post-test in Group-B

Table 1: Pain in Group A

Table showing Mean value, Mean Difference, Standard Deviation and Paired‘t’ value between pre and post test scores of Pain among Group A.

Measurement	Mean	Mean Difference	Standard Deviation	Paired ‘t’ value
Pre-test	7.4	3.1	0.27	36.28
Post-test	4.3			

Graph 1

Bar diagram showing the pre and post test mean values of Pain on Visual Analog Scale among Group A.

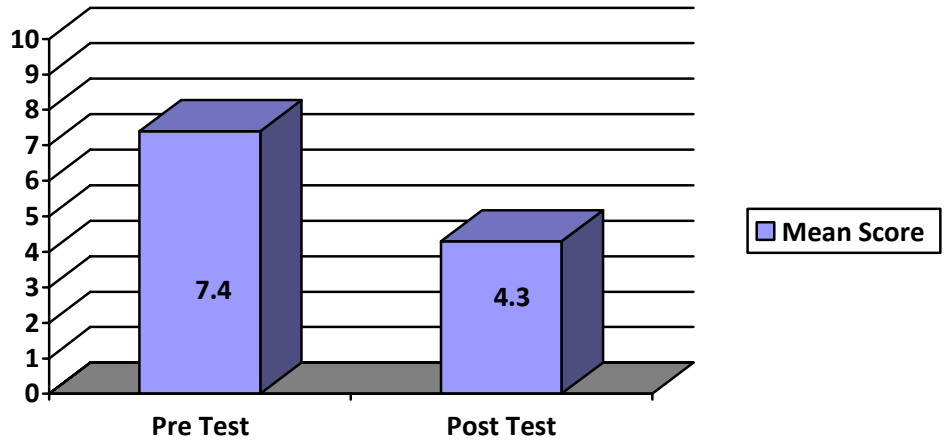


Table 2: Pain in Group B

Table showing Mean value, Mean Difference, Standard Deviation and Paired‘t’ value between pre and post test scores of Pain among Group B.

Measurement	Mean	Mean Difference	Standard Deviation	Paired ‘t’ value
Pre test	7.15	4.3	0.23	59.08
post test	2.85			

Graph 2

Bar diagram showing the pre and post test mean values of Pain on Visual Analog Scale among Group B.

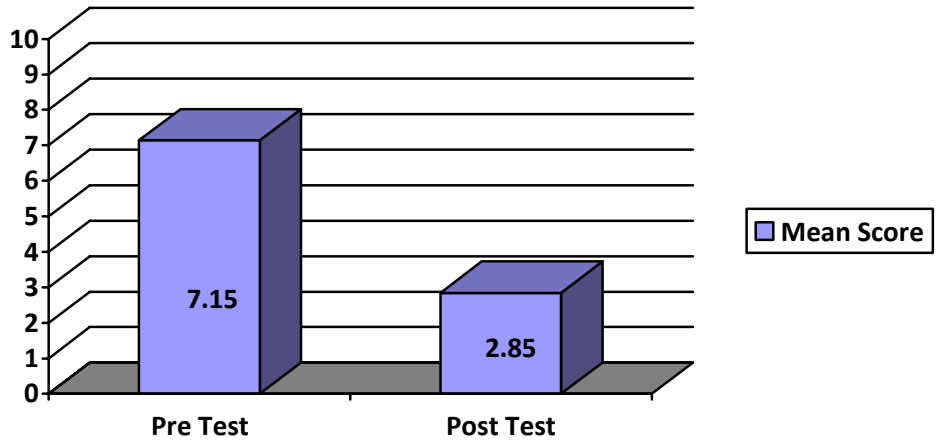


Table 3: Comparison of Pain between Group A and Group B

Table showing Mean value, Mean Difference, Standard Deviation, and Unpaired‘t’ Value scores between Group A and Group B.

S.NO	GROUPS	IMPROVEMENT		STANDARD DEVIATION	UNPAIRED ‘T’ TEST
		Mean	Mean Difference		
1	GROUP-A	3.1		1.2	2.23
2	GROUP-B	4.3	1.2		

Graph 3

Bar diagram showing Mean values of Pain on Visual Analog Scale in Group A and Group B.

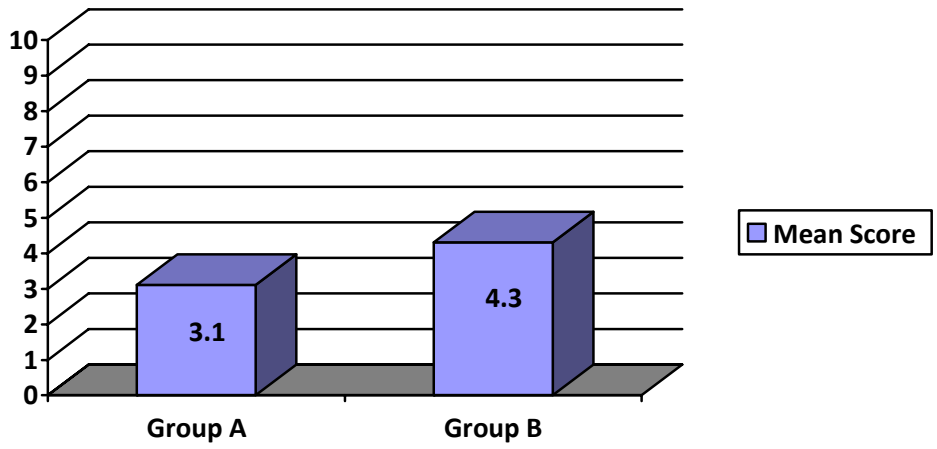


Table 4: Neck Function in Group A

Table Showing Mean value, Mean Difference, Standard Deviation and Paired‘t’ value between pre and post test scores of Neck Function among Group A.

Measurement	Mean	Mean Difference	Standard Deviation	Paired ‘t’ value
Pretest	17.8	*7.9*	1.23	20.29
post test	9.9			

Graph 4

Bar diagram showing the pre and post test mean values of Neck Function on Copenhagen Neck Function Disability Scale among Group A.

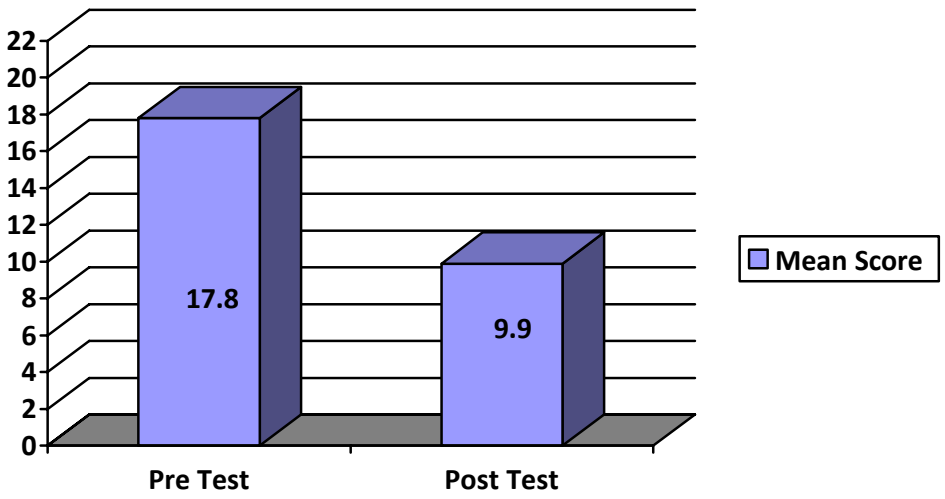


Table 5: Neck Function in Group B

Table showing Mean value, Mean Difference, Standard Deviation and Paired‘t’ value between pre and post test scores of Neck Function among Group B.

Measurement	Mean	Mean Difference	Standard Deviation	Paired ‘t’ value
Pre test	14.6	9.5	0.94	31.93
post test	5.1			

Graph 5

Bar diagram showing the pre and post test mean values of Neck Function on Copenhagen Neck Function Disability Scale among Group B.

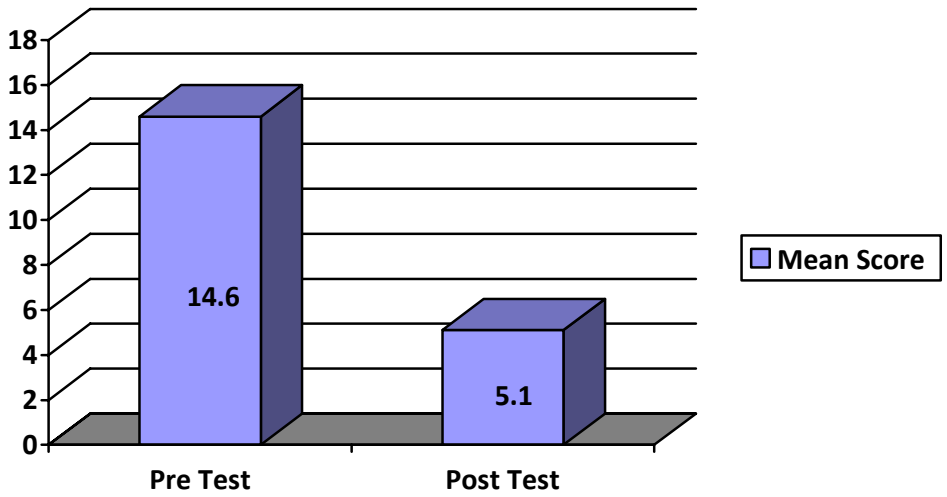


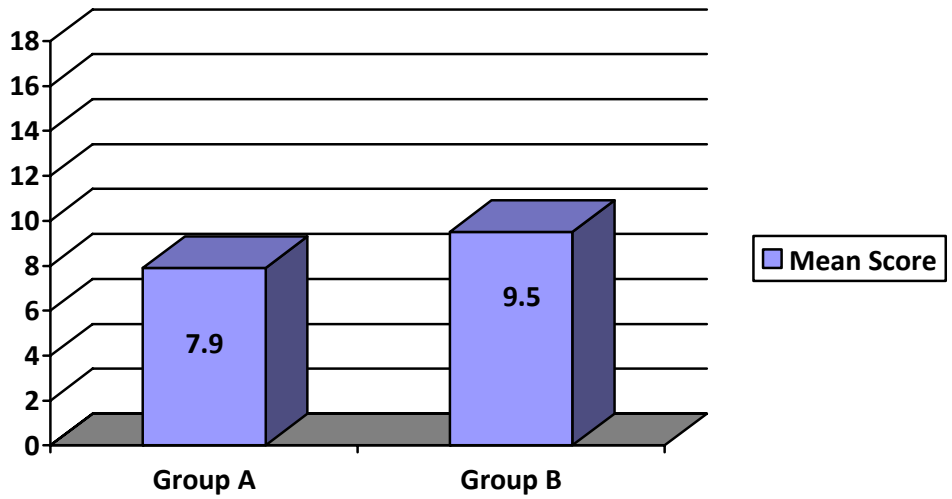
Table 6: Comparison of Neck Function between Group A and Group B

Table showing Mean value, Mean Difference, Standard Deviation, and Unpaired‘t’ Value scores between Group A and Group B.

S.NO	GROUPS	IMPROVEMENT		STANDARD DEVIATION	UNPAIRED “T” TEST
		Mean	Mean Difference		
1	GROUP-A	7.9		3.5	1.0
2	GROUP-B	9.5	1.6		

Graph 6

Bar diagram showing Mean values of Neck Function on Copenhagen Neck Function Disability Scale in Group A and Group B.



4.2 Results and Discussion

4.21 Results

Group A was treated with Ultrasound Therapy with Active Chin Tucking Exercises and Group B was treated with Ultrasound Therapy with Sub Occipital Muscle Release technique.

Analysis of Dependent Variable Neck Pain in Group A: The Calculated Paired‘t’ value is 36.28 at 0.05 level of significance and the Paired Table ‘t’ value is 1.83 at 0.05 level of significance. Hence, the calculated‘t’ value is greater than the Table‘t’ value.

Analysis of Dependent Variable Neck Pain in Group B: The Calculated Paired‘t’ value is 59.08 at 0.05 level of significance and the Paired Table ‘t’ value is 1.83 at 0.05 level of significance. Hence, the calculated‘t’ value is greater than the Table‘t’ value.

Analysis of Dependent Variable Neck Pain between Group A and Group B: The calculated Unpaired’t’ value is 2.23 at 0.05 level of significance and the Unpaired Table ‘t’ value is 1.73 at 0.05 level of significance. Hence, the calculated‘t’ value is greater than Table‘t’ value.

Analysis of Dependent Variable Neck Function in Group A: The Calculated Paired‘t’ value is 20.29 at 0.05 level of significance and the Paired Table ‘t’ value is 1.83 at 0.05 level of significance. Hence, the calculated‘t’ value is greater than the Table‘t’ value.

Analysis of Dependent Variable Neck Function in Group B: The Calculated Paired‘t’ value is 31.93 at 0.05 level of significance and the Paired Table ‘t’ value is

1.83 at 0.05 level of significance. Hence, the calculated‘t’ value is greater than the Table‘t’ value.

Analysis of Dependent Variable Neck Function between Group A and Group B: The calculated Unpaired’t’ value is 1.0 at 0.05 level of significance and the Unpaired Table ‘t’ value is 1.73 at 0.05 level of significance. Hence, the calculated‘t’ value is lesser than Table‘t’ value.

4.22 Discussion on findings

Non-Specific Neck pain is common among computer professionals because of as their faulty forward head posture while working on computers, which in turn places constant extension of the upper cervical structures causing tightness of the soft tissues in that area (Andrew Shashi Reggie, et al. 2012).

Studies of Jordan Miller, et al, (2010) shows that mobilization, manipulation and soft tissue techniques decreases pain and improve satisfaction in neck pain patients. Rupali Gupta, et al. (2011) concluded that stretching of Sub occipital muscle influenced pain when combined with other treatment techniques/ modalities in the management of neck pain in patients with cervicogenic headache. Hanten, et al. (2005) stated that manual therapy with home program of active neck retraction (Chin Tucking) exercises in a series of progressions was successful in relieving cervicogenic headache and improving neck function. Moodley M, (1999), studied and concluded that ultrasound therapy is helpful in treating Mechanical Neck pain.

The purpose of this study is to validate and compare the effects of combination of Ultrasound Therapy with Active Chin Tucking Exercise and combination of Ultrasound therapy with Sub occipital Release Technique on Pain and Neck Function among computer professionals.

The results of the present study indicate that the combination of Ultrasound therapy with Active Chin Tucking Exercise reduces pain and improves neck function as well, thereby validating the study of Hanten, et al. (2005). Whereas the combination of Ultrasound therapy with sub occipital Muscle Release technique reduces only pain and has no significant effect on the neck function among computer professionals having Non Specific Neck Pain, which is similar to the results in the study of Rupali Gupta, et al. (2011).

4.23 Discussion on Hypotheses

In Hypothesis 1 the researcher stated that **t**here is no significant difference following Ultrasound therapy with Active Chin Tucking Exercise in reducing Pain and improving Neck Function among computer professionals having Non-Specific Neck Pain.

This study shows that there is significant difference in reducing Pain and improving Neck Function following Ultrasound therapy with Active Chin Tucking Exercises. Therefore the Hypothesis was rejected.

In Hypothesis 2 the researcher stated that there is no significant difference following Ultrasound therapy with Sub occipital Muscle Release Technique in reducing Pain and improving Neck Function among computer professionals having Non-Specific Neck Pain.

This study shows that there is significant difference in reducing Pain and improving Neck Function following Ultrasound therapy with Sub Occipital Muscle Release Technique. Therefore the Hypothesis was rejected.

In Hypothesis 3 the researcher stated that there is no significant difference between Ultrasound therapy with Active Chin Tucking Exercise and Ultrasound

therapy with Sub occipital Muscle Release Technique in reducing Pain among computer professionals having Non-Specific Neck Pain.

This study shows that there is significant difference between Ultrasound therapy with Active Chin Tucking Exercises and Ultrasound therapy with Sub Occipital Muscle Release Technique in reducing Pain among Computer Professionals having Non-Specific Neck Pain. Therefore the Hypothesis was rejected.

In Hypothesis 4 the researcher stated that there is no significant difference between Ultrasound therapy with Active Chin Tucking Exercise and Ultrasound therapy with Sub occipital Muscle Release Technique in improving Neck Function among computer professionals having Non-Specific Neck Pain.

This study shows that there is no significant difference between Ultrasound therapy with Active Chin Tucking Exercises and Ultrasound therapy with Sub Occipital Muscle Release Technique in improving Neck function among Computer Professionals having Non-Specific Neck Pain. Therefore the Hypothesis was accepted.

V. SUMMARY AND CONCLUSION

5.1 Summary

A Pre-test Post-test Experimental study was conducted to compare the effectiveness of Active Chin Tucking Exercises and Sub Occipital Muscle Release Technique in reducing pain and improving neck function among computer professionals having non-specific neck pain.

20 subjects with neck pain were included in this study by purposive sampling and randomly assigned to two groups A and B with each group consisting of 10 subjects.

Group A was treated with Ultrasound Therapy with Active Chin Tucking Exercises and Group B was treated with Ultrasound Therapy with Sub Occipital Muscle Release Technique. Pain and Neck Function were assessed before and after the intervention by Visual Analog scale and Copenhagen Neck Function Disability Scale respectively.

The statistical result shows that there is improvement in both the groups. But when comparing both it was found that Sub Occipital Muscle Release Technique is more effective than Active Chin Tucking Exercises

5.2 Conclusion

- It is concluded that there is reduction of pain among computer professionals treated with Ultrasound Therapy and Active Chin Tucking Exercise for their neck pain.

- It is concluded that there is improvement in Neck function among computer professionals with neck pain treated with Ultrasound Therapy and Active Chin Tucking Exercise.
- It is concluded that there is reduction of pain among computer professionals treated with Ultrasound Therapy and Sub Occipital Muscle Release Technique for their neck pain.
- It is concluded that there is improvement also in Neck function among computer professionals with neck pain treated with Ultrasound Therapy and Sub Occipital Muscle Release Technique.
- It is concluded that combination of Ultrasound Therapy with Active Chin Tucking Exercise training group showed statistically significant improvement in neck function than the other group.
- It is concluded that Ultrasound Therapy with Sub Occipital Muscle Release Technique training group showed statistically significant reduction in pain than the other group.

5.3 Limitations

The study was conducted with a sample size of 20, the age group of the sample being 22 to 30 years with treatment duration of 6 days.

5.4 Recommendation

Future research can be conducted with a larger sample size, wider age group, different variables, more consistent outcome measures and different treatment durations.

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ANNEXURE-1

ASSESSMENT CHART

Physical therapy assessment chart

Name

Age

Gender

Occupation

Chief complaints

Medical history

- Past
- Present

Family history

Social history

Associated problems

On observation

- Body Built
- Posture
- Attitude of limbs
- Muscle wasting
- Edema
- Involuntary movement
- Gait
- Deformity

On palpation

- Tenderness
- Swelling
- Muscle tightness
- Warmth
- Other if any

Pain assessment

- Side
- Site
- Duration
- Nature
- Aggravating factor
- Relieving factor
- Other if any

On examination

- Vital signs
- Motor Assessment
    - Range Of Motion
    - End Feels
    - Manual Muscle Testing
- Sensory Assessment
    - Superficial Sensations
    - Deep Sensations
    - Combined

- Reflexes
    - Superficial
    - Deep
    - Clonus
- Dermatomes and Myotomes
- Limb Length Discrepancies
- Special Tests
- Functional Assessments
- Gait Assessments
- Posture

Investigations

Clinical Impression

Differential Diagnosis

Provisional Diagnosis

Treatment Goals

- Short Term Goals
- Long Term Goals

Treatment Plan

- Electrotherapy Modalities
- Manipulations
- Therapeutic Exercises
- Splints and Assistive Devices

Home Programme

Prognosis Evaluation

ANNEXURE-2

Table: 7 Pre and post-test Visual Analog Scale values of Pain among Group A

Sl. No:	Pre-test	Post-test	Difference (d)	Difference Squared(d^2)
1	7	3	4	16
2	8	4	4	16
3	7	4.5	2.5	6.25
4	8	3.5	4.5	20.25
5	8.5	6	2.5	6.25
6	6	3	3	9
7	8	5	3	9
8	7	4	3	9
9	7.5	5	2.5	6.25
10	7	5	2	4

Table: 8 Pre and post-test Visual Analog Scale values of Pain among Group B

Sl. No:	Pre-test	Post-test	Difference (d)	Difference Squared(d^2)
1	7.5	2.5	5	25
2	8	3	5	25
3	6.5	2.5	4	16
4	8.5	3.5	5	25
5	8	4	4	16
6	5	1	4	16
7	7	3	4	16
8	7.5	3.5	4	16
9	6.5	2.5	4	16
10	7	3	4	16

Table: 9

Pre and post-test Copenhagen Neck Function Disability Scale values of Neck Function among Group A

Sl. No:	Pre-test	Post-test	Difference (d)	Difference Squared(d^2)
1	18	5	13	169
2	23	11	12	144
3	18	12	6	36
4	18	4	14	196
5	19	11	8	64
6	13	8	5	25
7	19	13	6	36
8	15	9	6	36
9	17	13	4	16
10	18	13	5	25

Table: 10

Pre and post-test Copenhagen Neck Function Disability Scale values of Neck Function among Group B

Sl. No:	Pre-test	Post-test	Difference (d)	Difference Squared(d^2)
1	17	3	14	196
2	18	6	12	144
3	13	4	9	81
4	19	7	12	144
5	19	7	12	144
6	11	2	9	81
7	12	6	6	36
8	13	6	7	49
9	11	5	6	36
10	13	5	8	64

ANNEXURE-3

COPENHAGEN NECK FUNCTION DISABILITY SCALE

Name: _____ Date: _____

Please indicate how your neck pain has been affecting you ***during the last week*** by circling the appropriate number in the columns to the right of each question:

		yes	***occasionally***	***no***
1	Can you sleep at night without neck pain interfering?	*0*	*1*	*2*
2	Can you manage daily activities without neck pain reducing activity levels?	*0*	*1*	*2*
3	Can you manage daily activities without help from others?	*0*	*1*	*2*
4	Can you manage putting on your clothes in the morning without taking more time than usual?	*0*	*1*	*2*
5	Can you bend over the wash basin in order to brush your teeth without getting neck pain?	*0*	*1*	*2*
6	Do you spend more time than usual at home because of neck pain?	*2*	*1*	*0*
7	Are you prevented from lifting objects weighing from 2-4 kg due to neck pain?	*2*	*1*	*0*
8	Have you reduced your reading activity due to neck pain?	*2*	*1*	*0*
9	Have you been bothered by headaches during the time that you have had neck pain?	*2*	*1*	*0*
10	Do you feel that your ability to concentrate is reduced due to neck pain?	*2*	*1*	*0*
11	Are you prevented from participating in your usual leisure time activities due to neck pain?	*2*	*1*	*0*
12	Do you remain in bed longer than usual due to neck pain?	*2*	*1*	*0*

13	Do you feel that neck pain has influenced your emotional relationship with your nearest family?	*2*	*1*	*0*
14	Have you had to give up social contact with other people during the past one week due to neck pain?	*2*	*1*	*0*
15	Do you feel that neck pain will influence your future?	*2*	*1*	*0*

TOTAL SCORE =

ANNEXURE-4

CONSENT FORM

I ……aged……yrs, voluntarily consent to participate in the research named **"A comparative study between Combinations of ultrasound therapy with Active Chin Tucking Exercise and ultrasound therapy with Sub occipital Muscle Release in the management of Non-Specific Neck Pain due to sub occipital muscle tightness among computer professionals."**

The researcher has explained me the treatment approach in detail, risk of participation and has answered all the questions pertaining to the study to my satisfaction.

Signature of Subject **Signature of Researcher**

Signature of Witness